WIRE - Weather Intelligence for Renewable Energies

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WIRE – Weather Intelligence for Renewable Energy

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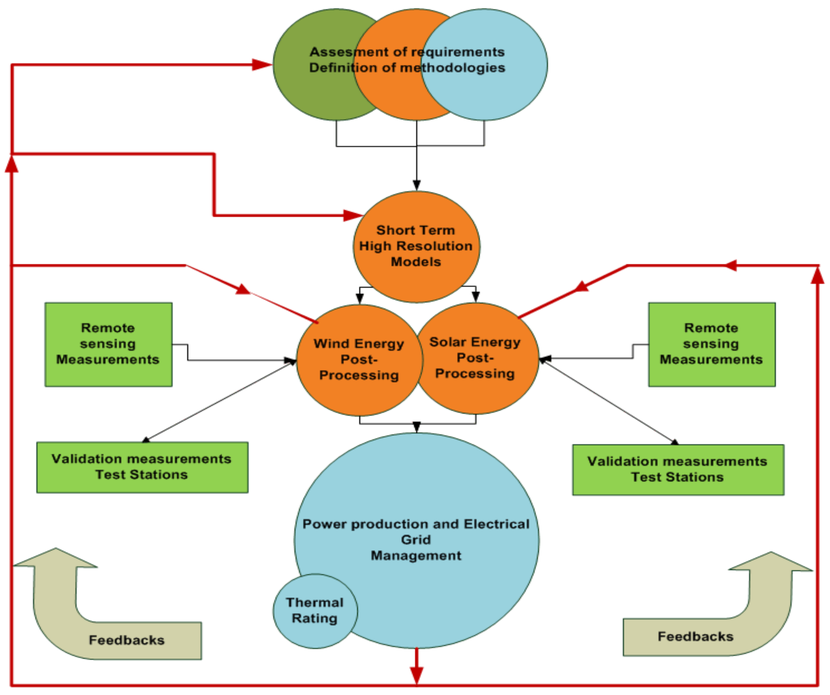


Mt-Soleil/Mt-Crosin (CH

Objectives:

The main goal of the Action is to contribute enhancing methodologies of forecasting wind and solar power production in the time domain from a few minutes up to several days ahead. This will be achieved by:

- Combining numerical weather models with suitable post-processing methods as well as real-time surface and remote sensing measurements.
- Establishing a common understanding between the relevant communities (wind and solar, meteorologists, energy engineers, grid managers) in order to optimize the technical and economic integration of these renewable energies into electricity grids and markets.
- Transfering knowledge across Europe, connecting the scientific and end user communities

Working Group 1 – Modeling and post-processing

In the first phase of the project, a critical assessment of past and present research activities in different countries and of current knowledge gaps will be performed (State-of-the-Art, SOTA). This has to highlight the existing weaknesses for all components of the renewable energy forecast system. In particular, it will allow evaluating the adequacy of numerical weather models coupled with dedicated power conversion modules to deliver accurate power production forecasts.

Furthermore, the potential of downscaling models towards higher spatial resolution will be analyzed in order to evaluate its impact when combined with appropriate post-processing applications.

If proved necessary, the project will promote the development of downscaling methodologies adapted to the need of wind and solar energy applications.

Working Group 2 – Measurements and Observations

WG2 will quantify the added value of the new observation techniques in further developing power forecasting models. In particular, the focus will be on how including ground-based and space-borne (satellite) remote sensing technologies will improve the quality of the production forecasts including at the post-processing level. Recommendations will be provided to the scientific and users communities.
Ground-based remote sensing systems include:

- Weather radars, cloud radars, ceilometers, Total Sky Imagers, pyrgeometers, and combinations of these systems;
- Wind profilers and LIDARs for the wind speed and direction fields, or combinations of them;
- LIDAR and micro-wave systems for the determination of Liquid Water Content LWC (and possibly the Particle Size Distribution PSD) of the boundary layer - presently products of the model itself – which are required for improving the high resolution models.

The results of these post-processing improved forecasting systems will be evaluated and validated. Existing wind farm and solar energy plant locations will be selected for the verification and additional ad-hoc measurements will be installed whenever possible. Database (s) containing the validation data will be set up and appropriately formatted for direct use by the modelers' community.

Working Group 3 – Power Plants and Electrical Grid Management

Finally, the development of improved forecasting systems will be done in cooperation with end users in order to guarantee a good match between the scientific developments and the user s' requirements. A tentative implementation of the forecasts into the operational strategies of the power plants and electrical grid operators will be evaluated. At this point, it is required to establish a high level interdisciplinary collaboration between science and industry. Secondary specific applications such as the influence of "thermal rating" and icing for power lines at selected test sites will also be performed.

Main Achievements:

- Status of art on research and development related to measurement, modeling and forecasting technologies for renewable energy integration
- Gathering and preparation of datasets for various sites in order to benchmark existing modeling and forecasting approaches

Ongoing Activities and Expected Results:

- Analysis of the added value from ground-based and space–born remote sensing measurements techniques for nowcasting, weather forecast modeling and post processing tools
- Evaluation of the economic benefit for the power production resulting from improved high resolution forecasts in terms of efficiency and cost savings
- Assessment of the effects of the intermittent character of renewable energies on the electrical grid management.
- Roadmap for modeling of solar and wind power production for the management of power plants and electrical grids.